Aquatic Macroinvertebrates

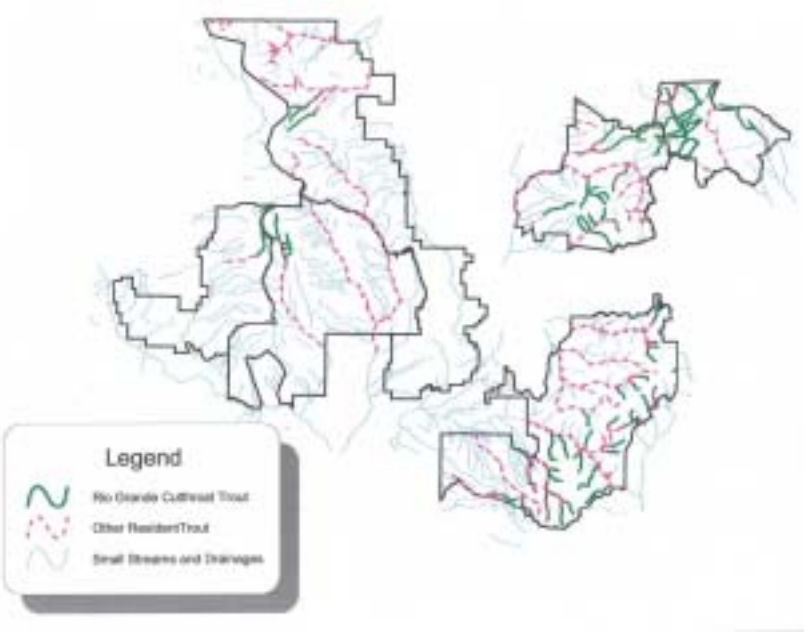
Indicator Species Habitat

Aquatic macroinvertebrates or aquatic insects are found in lakes, streams, ponds, marshes and puddles and help maintain the health of the water ecosystem by eating bacteria and dead, decaying plants and animals. Local populations of certain aquatic macroinvertebrates are indicator species of high quality water. They are indicator of overall aquatic conditions, quality of fisheries and associated riparian habitat (USDA 1986a, p.97). For the purpose of analyzing the effects of forest management activities, the primary habitat requirement for aquatic macroinvertebrates is perennial water.

However, many environmental factors and their interactions determine the composition and abundance of stream insects. In natural perennial streams, the key controlling factors are temperature, discharge/current, substrate, chemical conditions and aquatic/riparian vegetation. Overall water quality effects which types of organisms can survive in a body of water. Water quality may include the amounts of dissolved oxygen and the levels of algal growth, pollutants, which may be present, and the pH level.

Aquatic insects collectively show a wide range of tolerance to environmental conditions. Riparian vegetation conditions, temperature, hydraulics and substrate composition all change under natural conditions and in response the aquatic invertebrate communities generally reflect those changes. Various locations within a stream are likely to also have a range of conditions that dictate which aquatic invertebrate species are found there. Some taxa or species are more tolerant or have a wider range of acceptable habitat conditions than others.

Some macroinvertebrates such as stoneflies, mayflies and water pennies require a high level of dissolved oxygen and their abundance is an indication of good water quality. Other macroinvertebrates can survive at a lower dissolved oxygen level because they can come to the surface to get oxygen through a breathing or "snorkel" tube or carry a bubble of air with them around their bodies or under their wings.



Map 1. Aquatic Macroinvertebrate Potential Habitat Distribution on the Carson National Forest (USDA 1987)

Management Activities or Natural Events That May Affect Habitat

Negative: Taxa that are less tolerant of impacts (*Ephemeroptera*, *Plecoptera*, *Trichoptera*) affected by habitat degradation and alteration from activities such as road building, grazing, mining and dewatering.

Positive: Improvement of riparian habitats and upland watershed conditions through grazing and road management and best management practices.

Plans, Regulations and Guidelines Supporting, Maintaining or Improving Habitat

- *Carson National Forest Land and Resource Management Plan, Forest-wide Wildlife and Fish* standards and guidelines:
    - **ROAD MANAGEMENT…** Emphasize road management and resource/wildlife protection as a primary Forest policy (USDA 1986c, p. Wildlife & Fish –10).
    - **RIPARIAN WOOD VEGETATION…** On wet meadows and other riparian areas, favor the establishment of woody riparian vegetation as defined in FSH 2509.23. Control livestock and wildlife grazing through management and/or fencing to allow for adequate establishment of vegetation and the elimination of over use (USDA 1986c, p. Wildlife & Fish –12)

  The desired condition for Management Area 14 – Riparian is described as a stable fish population along the shaded, healthy stream and lake bottom, with diverse aquatic species. Manage for these indicator species: resident trout (cutthroat), hairy woodpecker, aquatic macroinvertebrates, elk. (USDA 1986c, Management Area Prescriptions for MA 14 Riparian-1 & 3).

- *Clean Water Act* (amended 1972 & 1987)

Habitat Condition And Trend On The Carson National Forest

In the 1986 Forest Plan EIS, the available habitat for both resident trout and macroinvertebrates was based on the total length of stream miles (estimated at 400 miles) on the Carson National Forest (USDA 1986a, p. 97). As discussed in the *Resident Trout* section of this assessment, data processing and GIS abilities has refined the amount of habitat to 444.26 miles. **The trend in available habitat is stable.**

Railroad logging in the early 1900's was one of the most significant events that affected stream systems on the Carson National Forest. Riparian conditions were seriously impacted by the use of tie staging along the streams. And the stream conditions were devastated as they were channelized to float cross-ties down to the Rio Grande. Over the next several decades, the watershed conditions rapidly eroded due to the lack of any herbaceous ground cover on the canyon slopes. By the mid-1900's, the federal government had gradually acquired lands, once privately owned by logging companies, into the National Forest System. Riparian areas and stream conditions improved as managed grazing systems were established, watershed restoration projects were implemented (which began as early as 1933), roads were closed and obliterated, and logging practices changed.

Today, road systems are the primary source of sedimentation in streams on the Forest. Although affected streams may still be suitable, they are less than optimal for aquatic macroinvertebrates that require high water quality. Other factors that reduce habitat quality include domestic livestock grazing, which can destroy overhanging banks and increase sedimentation, and diversions of water for irrigation, which can significantly reduce the amount of water in a stream system. Dewatering and sedimentation are the two most prevalent factors affecting habitat conditions (Duff 1996).

Habitat conditions on the Carson National Forest vary by stream and by location within the stream. Overall, most habitats appear able to support diverse communities of aquatic macroinvertebrates. Stream habitat surveys, which are ongoing, will better qualify conditions in specific streams over time. **Since the implementation of the Carson Forest Plan in most areas of the forest, physical condition of aquatic habitat appears to be stable or improved.**

Population Trend And Viability

Macroinvertebrate communities are used to display changes from management activities or natural effects and can decline or recover quickly or in the long-term, depending on the type and duration of the impact. Overall, diverse communities of aquatic macroinvertebrates are represented Forest-wide, and are considered stable unless an influence or significant event affects a local or given reach of stream. Most populations, however, can quickly recover.

Because of the volatile fluctuations that can occur in most aquatic macroinvertebrate populations, trends by numbers are of little value unless long-term studies show persistent changes. Persistent absences or declines or in some cases appearances of certain benthic organisms may also indicate a change in aquatic health. **Population trends for aquatic macroinvertebrates on the Carson National Forest appear to be stable, although additional time is necessary to determine a more reliable indication of trend.**

Aquatic macroinvertebrate surveys and analysis have been conducted on several streams within the Forest. Representative streams and sample points within those systems have been selected for aquatic macroinvertebrate sampling. Initial baseline data was collected in 1982. Additional points were included and monitoring samples collected annually between 1997 and 2001. The following are the sampling locations on the Carson National Forest:

Table 1. Sampling Locations for Aquatic Macroinvertebrate Monitoring on the Carson National Forest

Station	Water Body	Segment	Ranger District
COMANCHE01	Comanche Creek	upstream from Clayton Camp	Questa
COMANCHE02	Comanche Creek	upstream from La Belle	Questa
COMANCHE03	Comanche Creek	upstream from Gold	Questa
COMANCHE04	Comanche Creek	0.5 miles downstream from Gold	Questa
COMANCHE05	Comanche Creek	upstream from Little Costilla	Questa
COMANCHE06	Comanche Creek	downstream from Little Costilla	Questa
COMANCHE07	Comanche Creek	downstream from Chuckwagon	Questa
COMANCHE08	Comanche Creek	at Comanche Point	Questa
COMANCHE20	Comanche Creek	within large exclosure	Questa
COMANCHE21	Comanche Creek	downstream from large exclosure	Questa
COMANCHE22	Comanche Creek	upstream from large exclosure	Questa
CWAGON-01	Chuckwagon Creek	0.25 miles upstream from mouth	Questa
ELRITO-A	El Rito Creek	1 mile upstream from barrier	El Rito
ELRITO-B	El Rito Creek	0.5 mile upstream from barrier	El Rito
ELRITO-C	El Rito Creek	0.5 mile downstream from barrier	El Rito
ELRITO-D	El Rito Creek	1 mile downstream from barrier	El Rito
ELRITO-E	El Rito Creek	upstream from campground	El Rito
ELRITO-F	El Rito Creek	at campground	El Rito
ELRITO-G	El Rito Creek	downstream from campground	El Rito
FERNANDZ01	Fernandez Creek	0.25 miles upstream from mouth	Camino Real
LITTCOST01	Little Costilla Creek	0.25 miles upstream	Questa
POT-01	Rito de la Olla	lower	Camino Real
POT-02	Rito de la Olla	middle	Camino Real
POT-03	Rito de la Olla	upper	Camino Real
POWDER-01	Powderhouse Creek	lower	Questa
POWDER-02	Powderhouse Creek	middle	Questa
POWDER-03	Powderhouse Creek	upper	Questa
RRBELOW	Red River	just downstream from town	Questa
RRDEBRIS	Red River	0.5 miles downstream from town	Questa
RRDOWNMINE	Red River	downstream from Molycorp	Questa
RRTOWN	Red River	in town	Questa
RRUPMINE	Red River	upstream from Molycorp	Questa
TIOGRAN-01	Tio Grande Creek	lower	Camino Real
TIOGRAN-02	Tio Grande Creek	middle	Camino Real
TIOGRAN-03	Tio Grande Creek	upper	Camino Real
VIDAL01	Vidal Creek	upstream from Clayton Camp	Questa

The following is a summary of general assemblages of dominant families from the *Aquatic Invertebrate Monitoring Report, Carson National Forest* (Vinson 2002). Populations are generally represented by a diverse number of families and including those that show sensitivity to degraded aquatic systems and pollution.

Table 2. General Assemblages of Aquatic Macroinvertebrates on the Carson National Forest

Station	Date	Sample ID	Total Abundance	EPT Abundance	# of Families	Dominant Family	Dominant Family Abundance	Dominant Family % Contribution
COMANCHE01	06/08/1998	108762	1054	688	14	Leptohyphidae	326	30.93
COMANCHE01	09/26/1982	112790	519	144	12	Elmidae	168	32.37
COMANCHE02	06/30/1998	108763	2398	2000	16	Heptageniidae	1072	44.70
COMANCHE03	06/30/1998	108764	2319	1642	15	Heptageniidae	649	27.99
COMANCHE04	07/02/1998	108765	2301	1735	17	Heptageniidae	821	35.68
COMANCHE05	07/10/1998	108766	1487	1223	13	Leptohyphidae	568	38.20

Station	Date	Sample ID	Total Abundance	EPT Abundance	# of Families	Dominant Family	Dominant Family Abundance	Dominant Family % Contribution
COMANCHE05	09/26/1982	112791	1500	906	13	Hydropsychidae	501	33.40
COMANCHE06	07/10/1998	108767	2294	1892	19	Lepidostomatidae	961	41.89
COMANCHE07	07/10/1998	108768	2333	2057	13	Lepidostomatidae	796	34.12
COMANCHE08	06/08/1998	108769	2652	1326	17	Chironomidae	1039	39.18
COMANCHE08	09/24/1982	112792	771	555	14	Glossosomatidae	225	29.18
COMANCHE20	06/09/2001	116366	620	358	12	Chironomidae	129	20.81
COMANCHE21	06/19/2001	115209	2544	2072	18	Heptageniidae	701	27.56
COMANCHE22	06/19/2001	115210	4579	2169	16	Chironomidae	1914	41.80
CWAGON-01	09/15/1998	108758	541	301	15	more than one	161	29.76
CWAGON-01	09/26/1982	112793	276	90	9	Chironomidae	9	19.57
ELRITO-A	07/16/2001	115199	2728	1914	9	Lepidostomatidae	1018	37.32
ELRITO-B	07/16/2001	115200	1208	885	10	Lepidostomatidae	427	35.35
ELRITO-C	07/16/2001	115201	2295	1427	15	Lepidostomatidae	983	42.83
ELRITO-D	07/16/2001	115202	1781	1409	9	Lepidostomatidae	871	48.91
ELRITO-E	08/03/2001	115203	294	204	15	Helicopsychidae	75	25.51
ELRITO-F	08/03/2001	115204	767	584	17	Heptageniidae	158	20.60
ELRITO-G	08/03/2001	115205	240	90	14	Chironomidae	72	30.00
FERNANDZ01	07/10/1998	108760	1118	452	14	Chironomidae	351	31.40
FERNANDZ01	09/26/1982	112794	405	144	8	Elmidae	195	48.15
LITTCOST01	07/31/1998	108759	215	100	11	Elmidae	82	38.14
LITTCOST01	09/26/1982	112795	612	198	12	Simuliidae	174	28.43
POT-01	09/04/2001	116363	1308	566	13	Chironomidae	627	47.94
POT-02	9/04/2001	0116364	935	624	16	Chironomidae	237	25.35
POT-03	09/06/2001	116365	1254	724	19	Chironomidae	323	25.76
POWDER-01	06/26/1997	103966	190	168	10	Heptageniidae	86	45.26
POWDER-01	09/11/1997	103967	179	68	14	Elmidae	79	44.13
POWDER-01	07/15/1998	108774	2312	523	15	Simuliidae	1068	46.19
POWDER-01	09/10/199	108775	566	258	12	Elmidae	240	42.40
POWDER-01	09/24/1982	112797	180	165	12	Baetidae	51	28.33
POWDER-01	08/24/1999	115206	409	269	9	Heptageniidae	211	51.59
POWDER-02	09/11/1997	103968	276	154	17	Elmidae	72	26.09
POWDER-02	09/08/1997	103970	656	276	20	Elmidae	294	44.82
POWDER-02	07/15/1998	108772	430	165	14	Elmidae	183	42.56
POWDER-02	09/10/1998	108773	867	401	13	Elmidae	315	36.33
POWDER-02	08/24/1999	115207	602	373	12	Heptageniidae	297	49.34
POWDER-03	09/11/1997	103969	441	158	15	Elmidae	158	35.83
POWDER-03	09/08/1997	103971	538	183	15	Elmidae	258	47.96
POWDER-03	07/15/1998	108770	1233	373	16	Chironomidae	430	34.87
POWDER-03	09/10/1998	108771	1072	487	16	Elmidae	441	41.14
POWDER-03	08/24/1999	115208	391	229	10	Heptageniidae	161	41.18
RRBELOW	07/17/1998	106628	369	237	5	Brachycentridae	190	51.49
RRDEBRIS	08/08/2000	112605	43	39	4	Ephemerellidae	25	58.14
RRDOWNMINE	07/16/2000	112606	681	462	10	Brachycentridae	254	37.30
RRDOWNMINE	08/08/2000	112607	581	520	10	Brachycentridae	344	59.21
RRDOWNMINE	09/23/2000	112608	340	305	9	Brachycentridae	151	44.41
RRTOWN	07/17/1998	106629	151	129	7	Brachycentridae	90	59.60
RRUPMINE	07/16/2000	112609	896	814	8	Brachycentridae	333	37.17

Station	Date	Sample ID	Total Abundance	EPT Abundance	# of Families	Dominant Family	Dominant Family Abundance	Dominant Family % Contribution
RRUPMINE	07/16/2000	112610	262	208	8	Baetidae	86	32.82
RRUPMINE	09/23/2000	112611	509	412	11	Baetidae	172	33.79
TIOGRAN-01	07/26/2001	115211	1115	634	15	Heptageniidae	495	44.39
TIOGRAN-02	07/26/2001	115212	491	312	11	Heptageniidae	168	34.22
TIOGRAN-03	07/26/2001	115213	710	552	15	Heptageniidae	419	59.01
VIDAL01	06/08/1998	108761	3074	1333	19	Chironomidae	921	29.96
Mean			1066	656	13		401	37.62

Abundance data is number per meter squared for quantitative samples and number per sample for qualitative samples. NC = Not calculated. * = unable to calculate. EPT = totals for the insect orders, *Ephemeroptera*, *Plecoptera*, *Trichoptera*. In station descriptor, QL = qualitative sample.

Based on the highly fluctuating nature of macroinvertebrate organisms due to hatch timing, stream drift and other factors such as yearly variations in flow and water temperatures; it will likely take many years to determine actual trends. **Apparent population trends are healthy and stable.**

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